

# Memorandum

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Be energy efficient!*

**To:** Grant Schuster, Chief,  
Bridge Design Branch 2  
Office of Structure Design North  
Division of Engineering Services

**Date:** March 20, 2017

**File:** 01-DN-101-KP 58.03  
Smith River  
Br. No. 01-0020  
(Dr. Fine Memorial Bridge)  
EA 01-436400

**From:** **Division of Engineering Services**  
Office of Design and Technical Services  
Structure Hydraulics and Hydrology Report

**Subject:** Hydraulic Report for Advance Planning Study for Gravel Placement Effects Report

We have completed a revised model for the Smith River bridge replacement structure. This report is based on the information from the Division of Engineering Services Structure Design Services Structure Hydraulics and Hydrology Location Hydraulic Report dated September 23, 2016 (FHR), for purposes of showing the effects of the proposed gravel construction bars used in various stages of construction. This is a theoretical model and may not represent the actual configuration of the construction appurtenances used in constructing this replacement structure.

**Proposed Project:**

This model was completed using combined surveys from District 1 and the NOAA LiDAR, Crescent City Digital Elevation Model. Per the General Plans submitted in early February, the proposed structure replacement is on the original alignment of the existing bridge location. The profile grade will be the same as the existing bridge grade.

Proposals for this structure include a gravel bar detour to be built just to the south of the existing alignment. This detour will be removed upon completion of the replacement bridge.

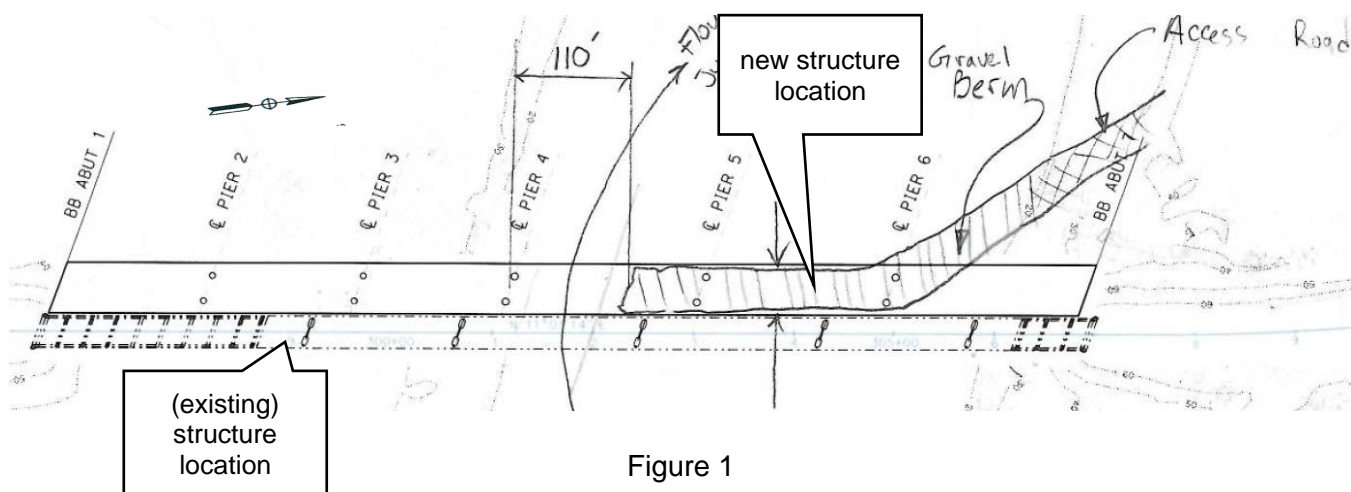


Figure 1

In profile view looking downstream one possible construction scenario would look like Figure2

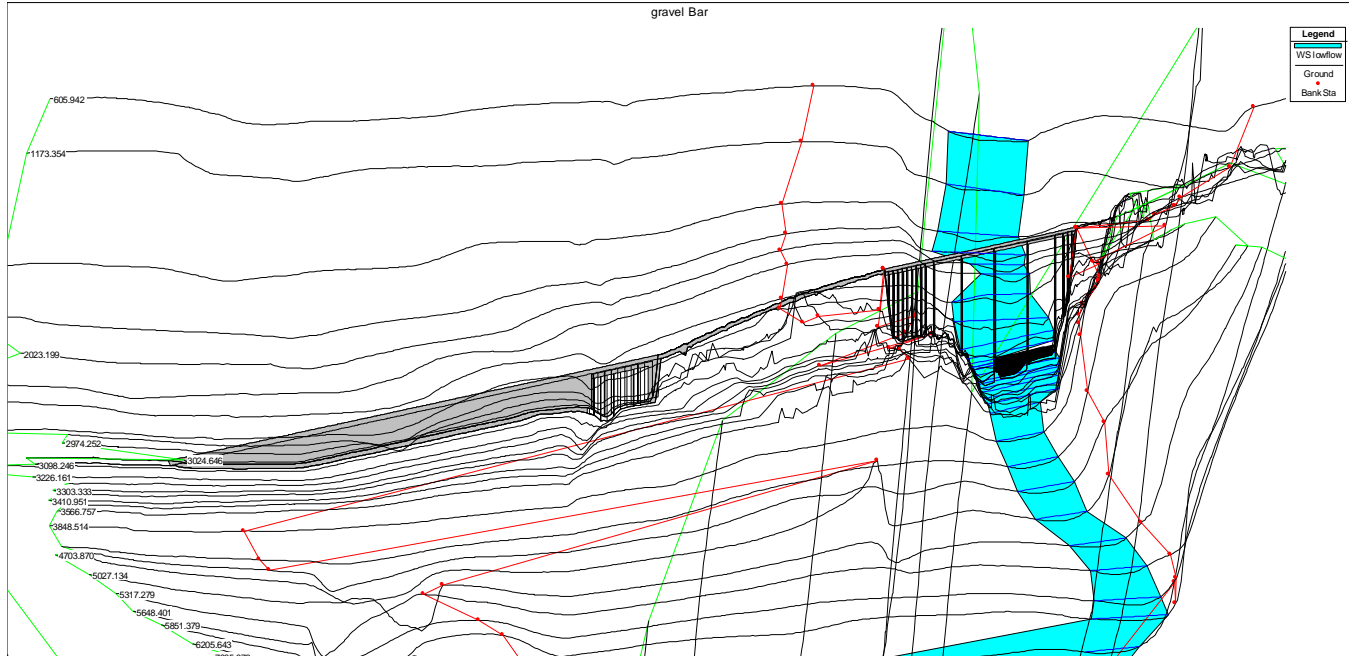


Figure 2

Figure 2 shows a partial 3d view of the possible scenario described above.

From the FHR report:

Hydrology and Hydraulic Information at Smith River Bridge (Dr. Fine Memorial Bridge)

Watershed area □ 667 mi<sup>2</sup>

Channel slope at bridge site □ 0.0012 ft./ft.

100-year discharge □ 250,000 ft<sup>3</sup>/s

50-year discharge □ 216,900 ft<sup>3</sup>/s

25-year discharge □ 187,900 ft<sup>3</sup>/s

Summer Flow discharge 1000 ft<sup>3</sup>/s

Design n □ 0.033 for the channel and 0.041 for the overbanks      Average Slope □ 0.002 ft./ft.

Historical flood December 1964 □ 228097 ft<sup>3</sup>/s (water surface elevation = 38.1 ft.)

#### Modeling results

All parameters were input into the US Army HEC-RAS version 4.1 software programs to generate the model results. . The proposed project will be constructed in stages. Each stage will impact the water surface elevations as structures are built. Structure Design has indicated the height of the gravel bars will be above the lowflow level of the of the construction season which is from June to October.

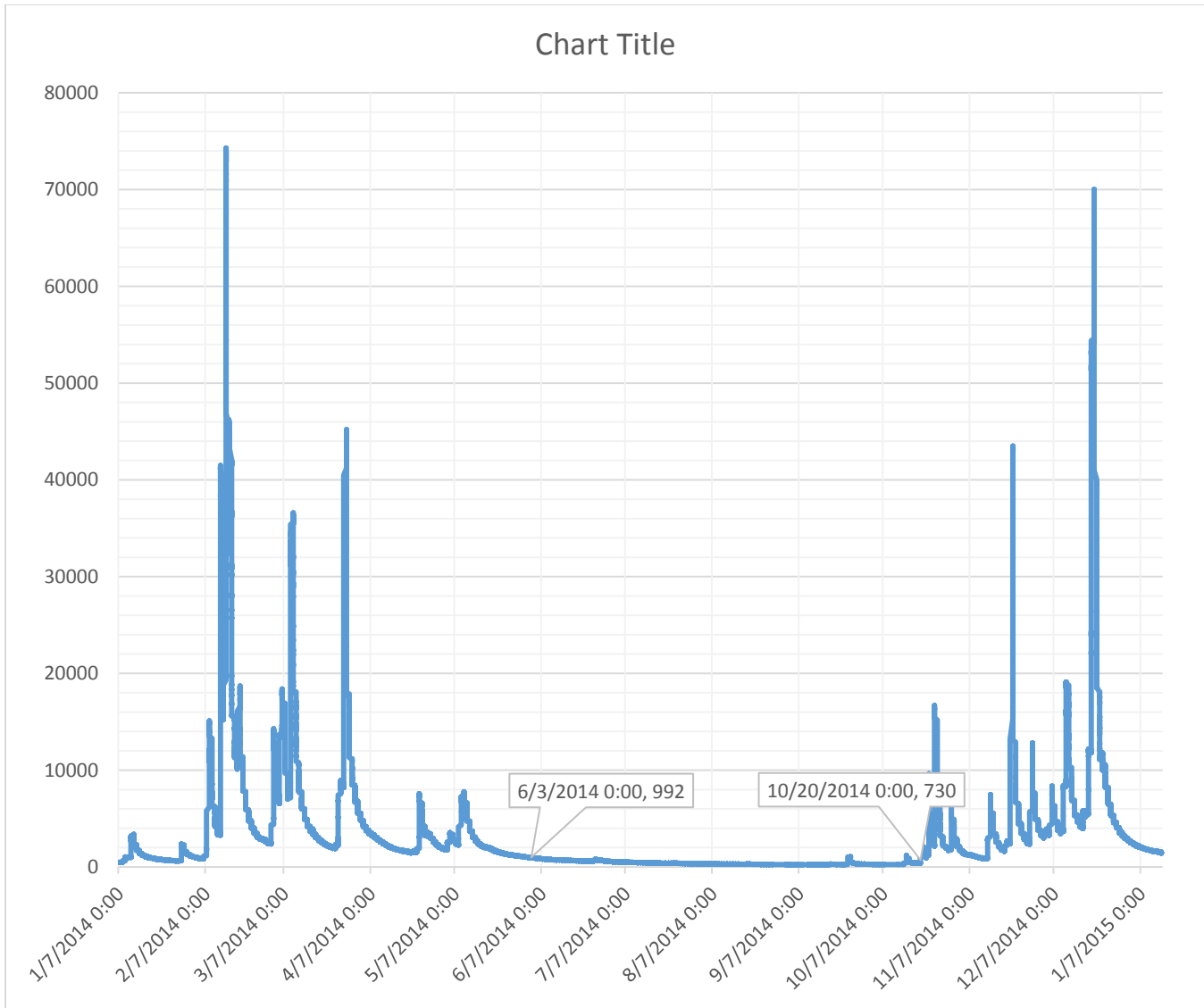


Figure 3

The construction season will be from June to October as shown in the chart above. The chart is based on the average flow seasons for the last 15 years..

**Water surface elevations:**

For the proposed gravel bar the water surface elevation is 17.71 feet the bar needs to be about 1 foot higher than at 18.7 feet.

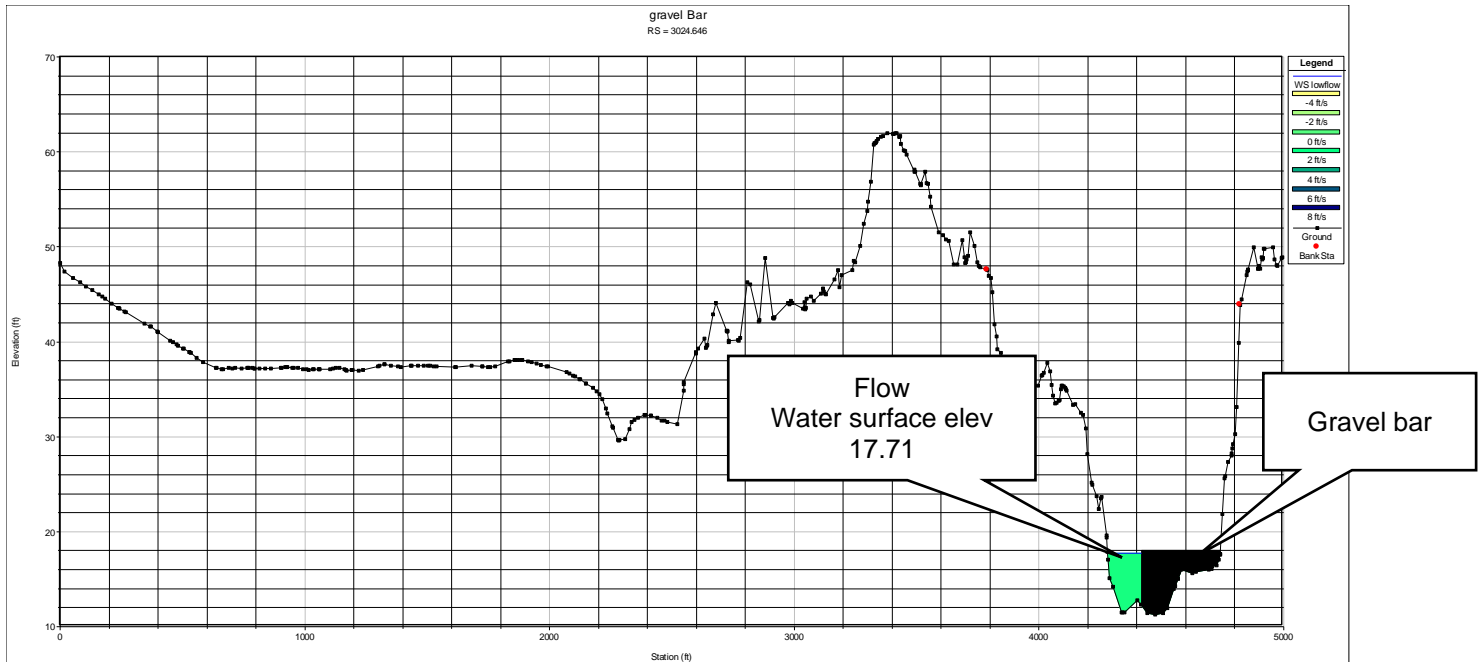


Figure 4

### Velocity

From a view of the flow in existing watershed leading into the existing structure, please see Figure 4. All the lowflow is to be squeezed into the relatively small bridge openings shown on the graphic.

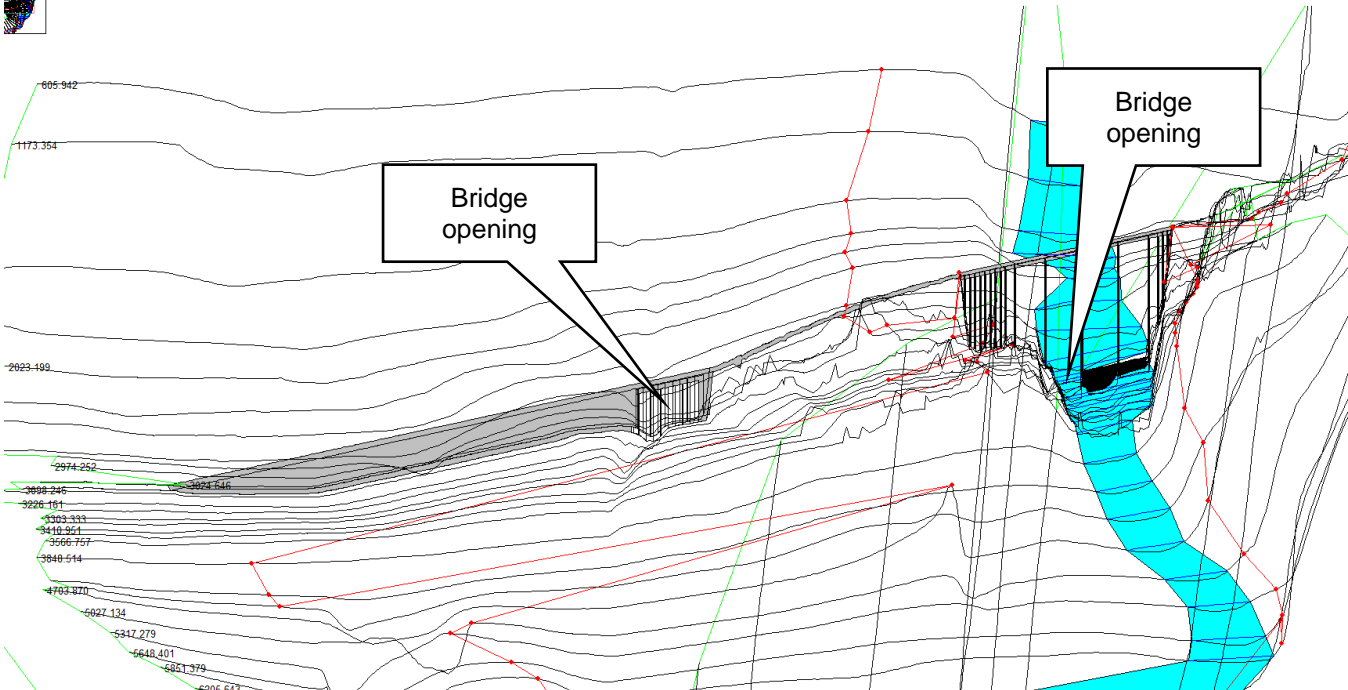


Figure 5

The resulting squeezing of the flow yields a maximum velocity of 1.7 ft/s. The backwater caused by this restriction is negligible.

**Scour:**

Scour for the Existing and Replacement structures have been covered in the FHR and will not be covered here.

For this scenario with the flow rate at 1000 cfs the maximum scour is 2.68 ft from the original ground line of the affected piers

**Recommendations**

The gravel bar at minimum elevation of 18 will work, to be conservative 18.7 is recommended. As long as there are no flows that raise the water surface elevations this solution is workable with acceptable velocities and scour limits

If you have any questions or need further clarification please contact Ronald McGaugh at [Ronald.mcgaugh@dot.gov](mailto:Ronald.mcgaugh@dot.gov) or 916 730 6422